BY GEORGE JASZI, ROBERT C. WASSON AND LAWRENCE GROSE

Expansion of Fixed Business Capital in the United States

Rapid Postwar Growth—Rise Slackens

IN connection with an inter-departmental study of economic growth, the Office of Business Economics is undertaking several projects aimed at the measurement and analysis of the Nation's capital stock and its characteristics. The purpose of this report is to highlight some of the major results of the first of these projects which has just been completed. The technical nature of the project is described in an appendix to this report; aspects of the methodology relevant to the interpretation of the results will be brought out in the text discussion.

Capital goods project

The unique feature of the project is that it presents calculations of the capital stock and its characteristics on the basis of a large number of alternative assumptions as to the economic service life of structures and equipment, depreciation formulas, and bases of valuation. Several variants are calculated because in our present state of knowledge we cannot choose any single one of them in the firm belief that it is the correct one. The present article discusses only a very small part of the calculations that have been made—namely, those most relevant to a summary description of the changes in fixed business capital that have occurred in the postwar period. No attempt is made to use the new series in the analysis of the many problems relating to the role of capital in the economy.

In view of the fact that the new figures cover the entire business economy and, moreover, provide a wide range of variant calculations, it was necessary to adopt rather summary statistical techniques in order to keep the project to manageable proportions. As a consequence, it is quite probable that detailed estimates of components or characteristics of the capital stock

that have been prepared in the past will be superior to the corresponding series taken from the present study. Anyone whose particular concern is with the intensive study of such components in isolation will probably want to use these estimates rather than the present OBE calculations. On the other hand, OBE's new study is more likely to be useful in obtaining an overall view of broad inter-relationships, and especially of the effect of alternative assumptions on the final results.

It should also be noted that some of the results indicated by the present project may be modified in the light of those produced by the somewhat more refined methodology that underlies a sequel of it that has been scheduled.

However, even if all available refinements are utilized, it is clear that, because of the conceptual uncertainties and data gaps, the result of these studies cannot be used like single-value estimates of the kind OBE prepares for most of the components of the national economic accounts. Rather they must be regarded as a set of alternative calculations, based upon a wide range of assumptions. They can be used by choosing among the variants the one most in line with one's economic conceptions, and also by examining a broad range of variants to extract the common story they tell. These general remarks, which are intended to ensure a proper understanding of the new figures, will become clearer in the light of the subsequent discussion, and by reference to the technical appendix.

We start with a review of gross business capital—i.e., capital measured before depreciation allowances for wear and tear and obsolescence. For some purposes magnitudes net of depreciation are more relevant, and these are taken up next. Finally, the changing age composition of business capital is discussed.

Summary conclusions

The major conclusions may be summarized as follows: The postwar investment boom has led to a very large increase in the Nation's stock of fixed business capital—structures and equipment. The rate of increase has tapered sharply, especially in recent years. This tapering has centered in equipment stocks, the major factor in the postwar expansion. Stocks of structures, whose relative expansion has been less spectacular, have continued to grow at rates that show little evidence of slackening.

Reflecting also the circumstance that the physical volume of equipment stocks at the beginning of the postwar period apparently was not much different from that of the late 1920's, whereas structure stocks were much lower, the growth of aggregate equipment stocks for the entire period since 1929 has kept pace with that of output. For stocks of structures, and consequently for stocks of fixed business capital as a whole, the capital-output proportions obtaining in the late 1920's have not been restored, in spite of the postwar boom. This generalization, it may be noted, does not take into account possible variations in the rate of utilization of capital.

The postwar expansion in capital stocks appears to have been relatively largest in manufacturing: the total of nonfarm industries outside manufacturing ranked second; the expansion in farming was the smallest among these three broad industry groups distinguished in the study. As compared with 1929 also the share of manufacturing appears to have increased.

In the early phases of the postwar boom, a marked improvement occurred in the age composition of the capital stock. The proportion of unexpired services available for future use embodied in the capital stock went up sharply; and the average age of the

capital stock was substantially reduced. For structures these tendencies have continued throughout the postwar period, although at a somewhat attenuated rate. In the case of equipment, however, there has been a substantial deterioration in both of these measures in recent years. However, this deterioration was from the uniquely favorable conditions that were reached at the crest of the postwar boom; as compared with 1929 the indicators of the current age structure of fixed business capital show no consistent change.

Postwar Investment Outlays

Table 1 shows gross outlays for fixed business investment for selected periods since 1927. The basic series are classified into nonresidential structures and equipment, and by broad industrial groups—farm, manufacturing, and all other industries.[1]

Gross investment in table 1 is measured in constant 1954 dollars—i.e., the current-dollar investment series have been corrected for price change to measure movements in the physical or "real" volume of investment.

Fixed business investment rose rapidly after it had been restricted to low levels during World War II. The early upsurge gave way to a more gradual rise to 1956–57, with dips in the 1949 and 1954 recessions and also in 1952. Subsequently, there were two more cyclical reductions—in 1958 and (in terms of the annual figures) 1961, and the 1957 peak was not regained in physical terms.

The broad postwar movements are similar for investment in equipment and in structures, except that the latter has shown a larger increase, in contrast with its prior lag which will be noted below.

Of the broad industrial groups distinguished, farm investment has expanded least, and investment in non-

farm industries other than manufacturing has done better than manufacturing investment. The latter difference can be traced to investment in structures, which has been stronger outside of manufacturing than in manufacturing and also has been a larger component of the total.

If, for historical perspective, the postwar period is compared with the late 1920's, large increases are of course seen to have occurred in the totals and major components of investment. Equipment investment has kept pace with the expansion of output, but investment in structures and consequently the total does not seem to have done so. This is apparent from the current-dollar figures, but much more pronounced in terms of the constant-dollar figures shown in table 1, because as compared with the late 1920's construction costs appear to have risen more than average.

Several hypotheses have been advanced to explain the unfavorable record of construction, such as excess investment in structures during the late 1920's, technological developments requiring fewer structures per unit of equipment, and the rapid rise in construction costs leading to economies in the use of structures. However, both facts and interpretations are uncertain here. The distinction between structures and equipment is not always meaningful and easy to establish. Also, as explained below, there is some doubt as to the validity of the indexes that indicate the much more rapid rise of construction prices; to the extent that they are incorrect the lag of investment in structures is exaggerated by the constant-dollar figures.

Meaning of "real" calculations

The calculation of the physical or real volume of equipment shown in the table runs into difficulties when products of altered quality or new products are introduced, because there is no obvious way to compare these with the products that have been in use before. Since quality improvement and the introduction of superior new products are particularly important features of capital goods in our economy, it is important to understand how these

difficulties are handled and the equivalence between the new and improved products and their predecessors is established. In essence, one unit of the new product is considered as equivalent to one unit of the old product times the ratio of the cost of the new product to that of the old product in an overlap period. (If an actual overlap period does not exist a hypothetical comparison is undertaken.) For instance, if a new model of a machine is introduced which costs $11,000, as compared with $10,000 for existing machinery of the unimproved type, it will be construed to represent 10 percent more real volume.

In other words, as a general proposition, better quality is counted as increased physical volume to the extent, and only to the extent, that it is reflected in higher real resource cost. This procedure is on all fours with the general treatment of different quality grades in real product measurement—a $20 shoe is considered twice as much production as the $10 variety selling at the same point in time.

Table 1.—Gross Fixed Business Investment, Selected Periods 1927–61

[Billions of constant (1954) dollars]

Age	1927–29 average	1943	1947	1957	1961
Total	21.9	8.3	32.8	40.4	36.5
Structures	11.8	2.4	9.9	15.7	15.4
Equipment	10.0	4.9	23.0	24.7	21.1
Farm	1.6	1.1	4.3	2.8	2.5
Structures	.5	.3	.7	.6	.6
Equipment	1.2	.9	2.5	2.2	2.2
Manufacturing	4.6	2.9	8.7	14.5	8.4
Structures	2.1	.3	2.5	6.0	2.3
Equipment	2.5	2.6	6.2	7.5	6.1
Other	15.6	5.4	24.8	27.1	25.6
Structures	9.3	1.8	6.7	12.1	12.7
Equipment	6.3	3.4	14.2	14.1	12.9

Source: U.S. Department of Commerce; Office of Business Economics.

This is not the place to discuss in detail the relative advantages and disadvantages of this procedure—the only general procedure for volume measurement that is available at present. It probably yields satisfactory measures when the aim is to analyze changes in the productivity (i.e., output relative to input) of capital over time. This could not be done if changes in the quality (productivity) of capital were included in measuring its real volume. However, when the aim is to get at a measure of productive capacity, the present

1. The series for gross investment in nonresidential structures and equipment are the same as the "other construction" and "producers' durables" components of the GNP after farm residences have been deducted and second-hand assets acquired by the private sector from Government added. The estimates for manufacturing here presented differ from similar estimates regularly published as part of the national income tables mainly in that no adjustment has been made in the present estimates to the "industrial buildings" component of the official construction statistics which is here taken as measure of manufacturing investment in structures.

techniques are not satisfactory because identical amounts of real capital as now measured will represent different capacities to produce goods and services over time; alternative measures would be desirable if they could be obtained.

As mentioned earlier, the constant-dollar estimates of construction are subject to a special limitation. The construction cost indexes available to correct the current-dollar series for price change refer generally to the prices of construction inputs—labor and materials—rather than to outputs. As a result the constant-dollar estimates tend to reflect the physical volume of inputs rather than of outputs. In other words, the estimates do not allow for increases in the productivity of the resources producing structures. This situation, it should be noted, differs from that described for equipment. In that case straightforward changes in productivity that result in more units of the same type of machinery are adequately reflected in the physical volume measure. Difficulties arise only if there occurs a change in the type of item produced.[2]

There is no information available to judge the quantitative effects of the statistical procedures that have been outlined. However, in the discussion which follows, an attempt will be made to qualify the conclusions to allow for possible bias in the constant-dollar structure estimate.

Gross Stocks of Capital

The investment figures discussed earlier are very helpful in the analysis of fluctuations and trends in economic activity. However, as in the case of other durable goods, proper interpretation of series on sales and purchases requires information on stocks.

Actual data on stocks of fixed capital are deficient, and in the present report, as in many other studies, indirect procedures are used to derive them. The essence of these procedures is to calculate stocks by applying information on the economic service lives of structures and equipment to the annual investment estimates. For instance, if a capital good was produced in year 1 and is thought to have a life of 10 years, it will be counted

as an element of the gross capital stock for the years 1 through 10. The series of gross capital stocks shown here have been derived by this method—specifically by applying appropriate lifetimes to the investment series summarized in table 1. (These series have been extended backward far enough to account for all elements of the capital stock beginning with the end of the year 1928.)[3]

Unfortunately, knowledge of economic lives cannot be firm in an economy such as ours in which, in addition to routine physical wear and tear, obsolescence enters as a major determinant. In the chart and table two variants are accordingly presented. One of

them is based largely on lives published in the Internal Revenue Service's Bulletin F (1942 edition). Inasmuch as it seems to be the prevailing feeling that these Bulletin F lives are generally too long, an alternative set of estimates assuming 20 percent shorter lives is also presented. This approximates closely the lives actually used by business in their accounting for tax purposes, as can be judged from the Treasury Depreciation Survey of 1959.[4] (Actual practice, it may be noted, up to now has been based upon service lives for equipment that are substantially longer than those suggested in the *Depreciation Guidelines and*

Table 2.—Gross Stocks of Fixed Business Capital,[a] Selected Years, 1929–61

[Billions of constant (1954) dollars]

	Based on Bulletin F lives						Based on lives 20 percent shorter					
	1929	1945	1949	1953	1957	1961	1929	1945	1949	1953	1957	1961
Total	406	395	459	537	626	679	346	316	367	452	509	552
Structures	284	272	280	302	342	363	250	215	214	248	284	307
Equipment	123	123	179	234	283	316	96	101	153	204	245	245
Farm	50	52	62	72	79	85	43	45	51	60	66	65
Structures	34	34	36	39	40	43	31	30	30	31	33	34
Equipment	15	18	26	34	39	43	12	15	21	29	33	32
Manufacturing	84	86	105	125	148	164	70	68	89	106	125	128
Structures	47	47	52	54	60	62	41	37	42	43	49	49
Equipment	36	38	53	71	88	102	30	31	47	62	76	80
Other	275	255	292	329	400	431	235	203	246	288	318	333
Structures	204	191	192	210	242	259	179	148	162	174	183	204
Equipment	71	65	100	129	167	171	56	55	64	114	135	134

[a] At year-end.

Source: U.S. Department of Commerce, Office of Business Economics.

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2. The following example may serve to clarify these points. Assume that the physical input of labor and materials is unchanged from period I to II, and that their unit price moves from 100 to 120 on an index number basis. Assume also that the physical volume of output increases 50 percent as a result of improved efficiency. The price of output is shown to decline from 100 to 80 (the same as unit costs, i.e., 120 divided by 150). This is on the reasonable assumption that the change in profits is roughly parallel to that of cost, and that to the extent that this assumption is not fully met, the proportion of profits to costs is not large enough to influence significantly the movement of the output price index. The total value of production rises 20 percent. If total values are deflated by the labor and materials cost index, the deflated value will show no change, i.e., the change in output per unit of input will not have been taken into account. This is an illustration of the procedure underlying the present construction estimates. If, on the other hand, the above example is taken to refer to producers' durable equipment, we have price indexes referring to output, and the deflated figures will show an increase of 50 percent. This is a correct reflection of the change in physical output, apart from possible changes in the quality of the product from period I to period II.

	Period	
	I	II
	(Index numbers)	
Labor and materials:		
Physical input	100	100
Unit prices	100	120
Output:		
Physical output	100	150
Unit prices	100	80
Value	100	120
Value deflated by—		
Labor and materials cost index	100	120
Output price index	100	150

The construction cost indexes have been reviewed recently in Appendix B of *Government Price Statistics*, Hearings before the Subcommittee on Economic Statistics of the Joint Economic Committee, Congress of the United States, 87th Congress, First Session, Part I, January 24, 1961, Washington, D.C. This document also discusses the general problem of quality change. A basic paper analyzing the latter problem is E. F. Denison: "Theoretical Aspects of Quality Change, Capital Consumption, and Net Capital Formation," in *Problems of Capital Formation, Studies in Income and Wealth*, Vol. 19, Princeton, 1957. See also *National Income—1954 Edition*, page 166.
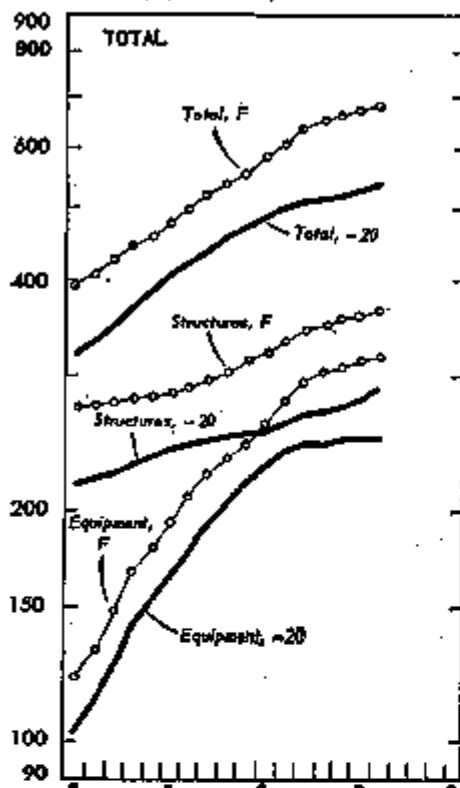
3. It should be noted that in the calculations summarized in this report—as well as in the first of the references cited in footnote 6—dispersion of retirements around the average service life has been neglected. Further studies will establish the effect of this on the calculations of gross capital stocks and related magnitudes. For a theoretical treatment of this topic, see Eric Schiff's note in the May 1958 issue of the *Review of Economics and Statistics*.

4. Detailed calculations indicated a somewhat larger reduction of lives as compared with Bulletin F for structures and a somewhat smaller reduction for nonfarm nonmanufacturing equipment. However, it was decided to disregard the differential for structures on the ground that it probably reflected the shorter lives of "additions and alterations," which are not specifically dealt with in Bulletin F and which, in all probability, are to a substantial extent omitted from the investment estimates. The differential for nonfarm nonmanufacturing was discounted because it was well within the range of error of the estimates. The 20 percent reduction for farm structures and equipment was an arbitrary factor applied to the basic variant which in turn was derived from Department of Agriculture studies.
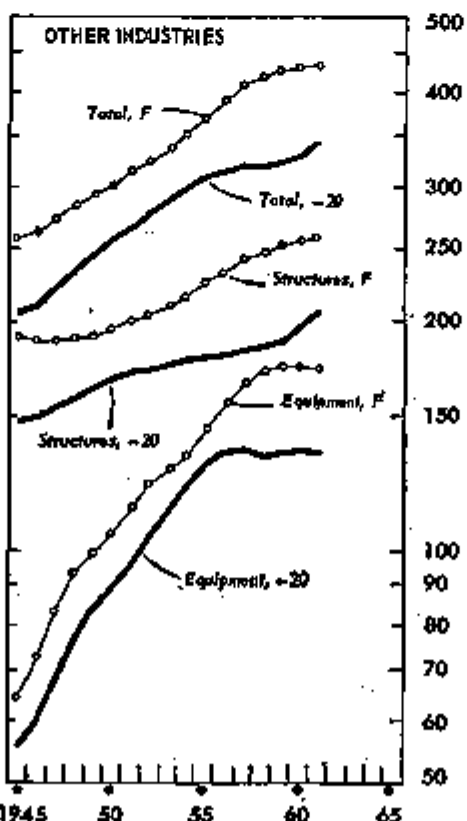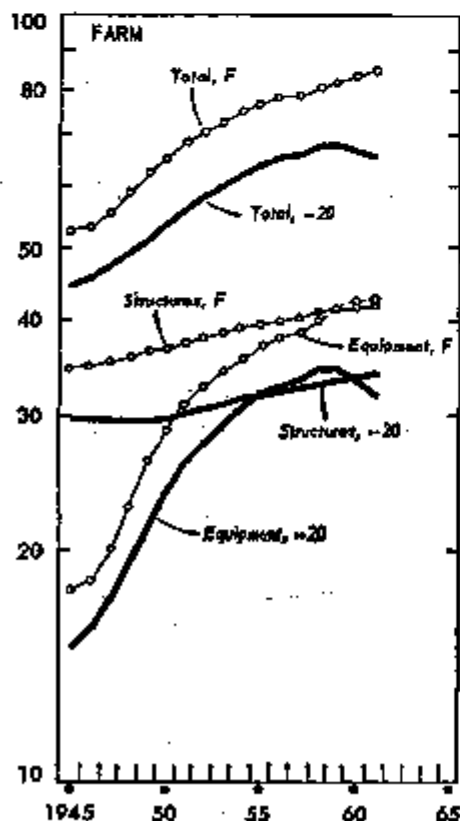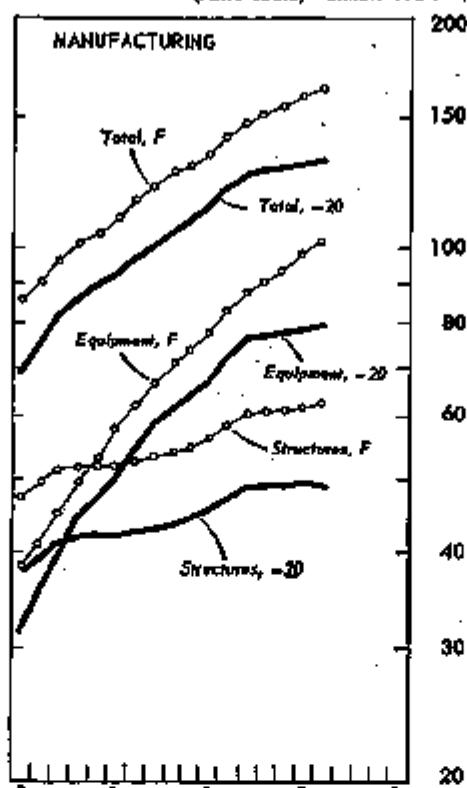
GROSS STOCKS OF FIXED BUSINESS CAPITAL

Broad Industry Groups Share in Postwar Expansion With Substantial Differences in Amplitude and Timing

Billion 1954 $ (ratio scale)

(ratio scale) Billion 1954 $

F = Bulletin F Lives (see technical appendix)
−20 = Lives 20 Percent Shorter

U.S. Department of Commerce, Office of Business Economics

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Rules issued last July by the Treasury Department.)

This alternative should not be taken as our estimate of "true" economic life. But it commends itself on the ground that it is close to actual tax practice for depreciation.[5] The variant based on Bulletin F is included to provide a feel for the direction and extent to which the calculations are affected by changes in the assumptions, and to furnish a bridge to past calculations based on similar methods which have generally utilized Bulletin F lives.[6] As explained in the appendix, the study underlying this report presents alternative series based on lives 10 percent, 20 percent, and 40 percent shorter and longer than Bulletin F lives.

Another limitation of stock figures derived by these techniques should be noted. The service lives used to translate gross investment into stock figures, even if correct on the average, will not hold invariably from year to year. For instance, during World War II, when investment was restricted, existing equipment continued to be used beyond its normal, average life. Accordingly, the stock figures shown in this report should not be interpreted as showing precisely the year-to-year changes. Also the calculations are necessarily based on the assumption that average lives have been constant in the long-run. There is little information on changes over time in the average service lives of the various types of structures and durable equipment.

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5. We do not know how closely practice for tax purposes conforms to the pattern of actual retirements.

6. The results of this study have been compared with the estimates of R. W. Goldsmith published in *The National Wealth of the United States in the Postwar Period*, Princeton, 1962, and of the Machinery and Allied Products Institute (MAPI) published in *60 Years of Business Capital Formation*, Washington, 1960. As expected, the three sets of figures differ widely as to detail. With respect to broad trends the OBE variants chosen for analysis in this report indicate a somewhat faster tapering in the postwar growth rates for nonfarm equipment and a more rapid deterioration in the net-gross equipment stock ratios. (See below.) Preliminary investigations suggest that much of these differences stem from the fact that the OBE variants selected are based on shorter service lives than the Goldsmith and MAPI estimates. Differences between Goldsmith's and OBE's figures on farm capital are due mainly to differences in the assumed service lives.

Growth in the postwar period

As can be seen from the chart on page 12 and table 2, gross stocks of fixed business capital increased by almost three-fourths over the postwar period, with the rate of increase tapering very sharply in the latter part of it. On the basis of the shorter life assumption, stocks increased at an average annual rate of about 4½ percent from 1945 to 1953, 3 percent in the next 4 years, and 1 percent from 1957 to 1961. According to the longer life assumption, the tapering set in a little later and was a little less pronounced.

Table 3.—Average Percent Annual Rates of Increase in National Output and Stock of Fixed Business Capital, 1929–61

[Based on constant 1954 dollars]

Gross National or Business Product: [1]	
Specific deflators	2.9
GNP deflators for construction	3.0
Net National or Business Product: [1]	
Specific deflators	3.0
GNP deflators for construction	3.0
Gross Stocks, based on—	
Bulletin F lives:	
Structures, based on	
Specific deflators	.8
GNP deflators	1.5
Equipment	3.0
Structures and equipment, based on	
Specific deflators	1.6
GNP deflators for structures	2.2
Lives 20% shorter:	
Structures, based on	
Specific deflators	.4
GNP deflators	1.8
Equipment	2.9
Structures and equipment, based on	
Specific deflators	1.3
GNP deflators for structures	2.0
Net Stocks, based on—	
Bulletin F lives, straight line depreciation:	
Structures, based on	
Specific deflators	.7
GNP deflators	1.7
Equipment	2.9
Structures and equipment, based on	
Specific deflators	1.6
GNP deflators for structures	2.2
Bulletin F lives, double declining depreciation:	
Structures, based on	
Specific deflators	.8
GNP deflators	1.8
Equipment	2.8
Structures and equipment, based on	
Specific deflators	1.5
GNP deflators for structures	2.2
Lives 20% shorter, straight line depreciation:	
Structures, based on	
Specific deflators	.8
GNP deflators	1.9
Equipment	2.7
Structures and equipment, based on	
Specific deflators	1.5
GNP deflators for structures	2.2
Lives 20% shorter, double declining depreciation:	
Structures, based on	
Specific deflators	.8
GNP deflators	1.9
Equipment	2.7
Structures and equipment, based on	
Specific deflators	1.4
GNP deflators for structures	2.2

1. Over this period percent growth rates for National Product and Business Product (i.e., National Product less product originating in households and institutions, government, and in the rest-of-the-world sector) both round to the same figure in tenths of percents. Also percent growth rates for Net Product calculated for the four permutations of Bulletin F lives, lives 20 percent shorter, straight line depreciation, and double declining balance depreciation round to the same figures in tenths of percents.

Source: U.S. Department of Commerce, Office of Business Economics.

For structures the postwar increase amounted to about one-third. For equipment it was about one and one-half—somewhat less on the basis of the shorter life assumption and somewhat more on the basis of the longer one. This is in contrast to the relative roles of structures and equipment in postwar investment, and results from the fact that the ratio of initial stocks to the subsequent investment was higher for structures than for equipment.

Both versions show that the tapering in the rate of growth of the total is traceable mainly to equipment. Again dividing the entire postwar period into equal spans of 4 years, gross equipment stocks appear to have increased at yearly rates of about 10 percent and 7 percent during the first two of these periods, respectively. Using the shorter life assumption, the rate dropped to 5 percent for 1953–57, and no further increase in equipment stocks occurred during 1957–61. On the basis of the longer life assumption, the rate dropped to 6 percent and 2 percent, respectively, in the 1953–57 and 1957–61 periods.

For farm stocks the indicated increase is a little smaller than for gross stocks as a whole; this is due mainly to the equipment component. Beyond this, there are considerable differences between the results of the two alternative calculations, the one based upon shorter lives indicating less expansion. Both series show a slackened rate of increase as the period progresses. This reflects mainly the equipment component and is more pronounced in the series based on the shorter lives. The farm structure component is derived from a gross investment series that is on a less firm statistical basis than the other components, and too much reliance should not be placed on its precise movement.

In manufacturing, gross stocks appear to have almost doubled since the beginning of the postwar period, with stocks of structures increasing one-third and equipment stocks more than one and one-half times. Again a slackening in the rate of increase is evident, and is more pronounced in the variant based upon the shorter lives.

Gross stocks in nonfarm industries other than manufacturing increased about two-thirds, with structure stocks increasing more than one-third and equipment stocks about one-half—somewhat less for equipment if the shorter and somewhat more if the longer life variant is used. As in the case of farms and manufacturing, the rate of increase is seen to slacken in both

COMPOSITION OF GROSS FIXED BUSINESS CAPITAL STOCKS
At End of 1961

STRUCTURES 54%
EQUIPMENT 46%

FARM 13%
MANUFACTURING 24%
OTHER 63%
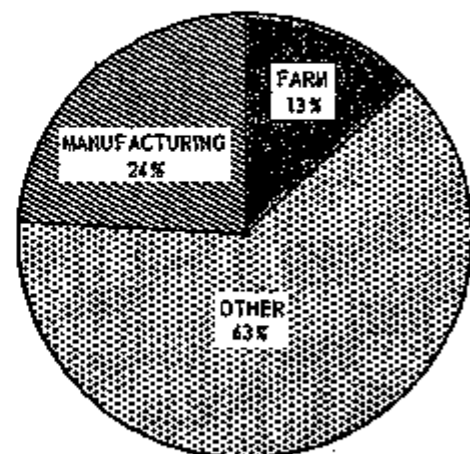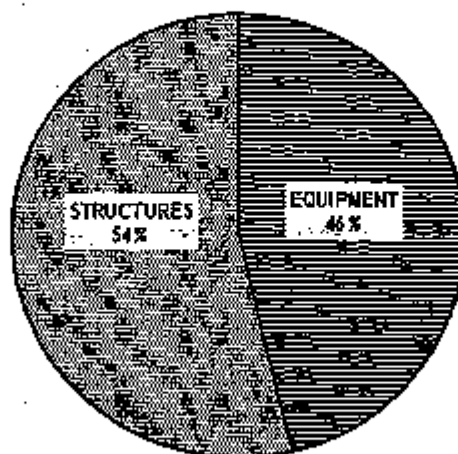
Note: Based on constant (1954) dollars, and Bulletin F(1942 edition) or 20 percent shorter lifetime variant.

U.S. Department of Commerce, Office of Business Economics

versions; this is more pronounced in the one based on shorter lives; and is traceable mainly to equipment.

Viewing the entire period since 1929, total gross stocks appear to have declined during the great depression and through World War II until 1944, before commencing their postwar upsurge. Over the period as a whole, their rate of growth appears to have been about one-half of that of total output. (See table 3.) The behavior of equipment and structure stocks was very different. Equipment stocks were about the same at the end of the war as they had been in 1929, and their average rate of growth from 1929 to date has been close to that of output. The volume of structures, on the other hand, appears to have declined from 1929 to 1944, and the subsequent rise did not bring it back to its previous relation to production. Possible changes in the rate of utilization of fixed business capital are not taken into account in these statements.

Valuation of structures

As in the case of gross investment, the indicated lag for structures is based upon calculations that do not take into account increased productivity per unit of labor and material input in construction. To the extent that this assumption is in error, the lag in structure stocks has been exaggerated in the calculations.

Unfortunately, it is not possible to resolve this issue on the basis of present knowledge. However, an alternative calculation has been made, assuming—rather arbitrarily—that changes in the average prices of nonresidential structures have paralleled those of gross national product produced in the nonfarm private business system.

On the basis of this assumption, the contours of the story are substantially changed. Briefly, the increase in business structures during the postwar period is more than twice that shown by the prior versions, and as a result the total of structures and equipment combined appears to have approximately doubled. The tapering in the rate of postwar growth of the total capital stock continues to be visible in this set of calculations as well.

The increase in stocks of structures as compared with 1929 is more substantial in this set of calculations than in the earlier ones. However, the indication persists that the stock of equipment has expanded much more rapidly, and that the growth of total capital stocks has been substantially below that of total output. (See table 3.)

In other words, whatever reasonable alternative assumptions we use when the true facts are not known to us, certain broad patterns continue to appear. But it is apparent that in this field of capital stock measurement we cannot claim quantitative precision even though we state our results in terms of numbers; the best that we can hope for at present is to perceive the general direction of some broad trends.

The chart on p. 13 shows the composition of the Nation's capital stock in 1961. As compared with a similar calculation for 1929, the proportion of equipment to structures is higher and the share of manufacturing in the total appears to have increased somewhat at the expense of all other nonfarm industries taken together. This is in accord with the increased share of manufacturing in total national output;[7] manufacturing's share in the total number of persons engaged in production has declined over this period.

The chart, it will be noted, is based on the deflation of structures by construction cost indexes. Their deflation by overall GNP deflators would yield a similar pattern of change as compared with 1929 and a similar picture for 1961, except that the 1961 share of structures in the total would be higher.
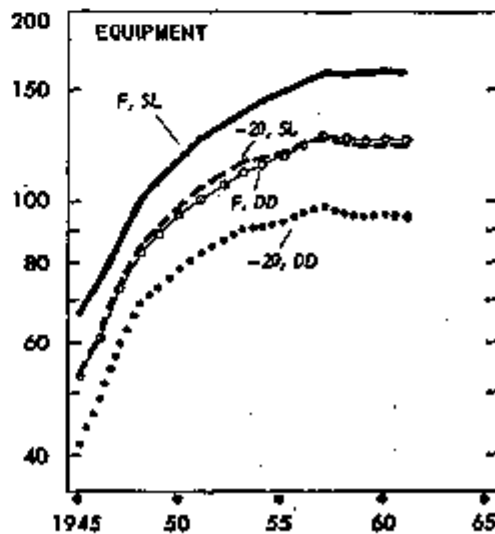
Net Capital Stocks

In the measures of capital stocks that have been reviewed, a unit of capital asset is included at its full value during the entire time that it remains in the capital stock, up to the assumed date of its retirement. For instance, an item costing $10,000 in its year of acquisition and remaining in the stock for 10 years will be valued in the capital stock at $10,000 in each of these years—abstracting, for the sake of simplicity, from price

7. Martin L. Marimont, "GNP by Major Industries," SURVEY OF CURRENT BUSINESS, October, 1962.

NET STOCKS OF FIXED BUSINESS CAPITAL

Rapid Growth of Equipment Slows During Postwar Period

Expansion of Structures Was Slower but Continues at Steady Rate

Billion $ (ratio scale)

KEY TO SYMBOLS

F, SL = Bulletin F lives, straight line depreciation

F, DD = Bulletin F lives, double declining balance depreciation

−20, SL = lives 20 percent shorter, straight line depreciation

−20, DD = lives 20 percent shorter, double declining balance depreciation
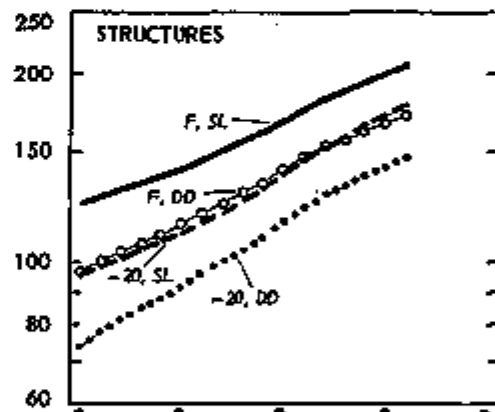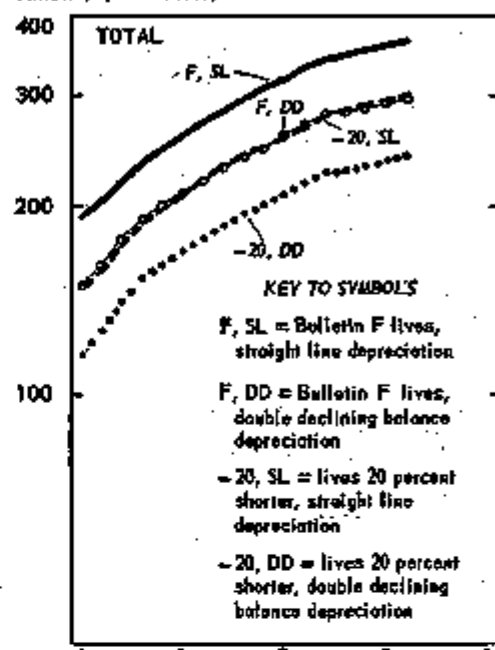
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changes. These "gross" measures of capital stocks are useful for many purposes. However, an alternative set of "net" measures can be calculated as being more relevant to others.

Underlying these net measures is a concept of capital as a sum of productive services stored up for future use. For instance, the $10,000 item just referred to is regarded as a sum of productive services that will be used up over the life of the capital asset, as it is employed jointly with labor and other economic resources to produce goods and services. If this view of capital is taken, a given structure or equipment item does not represent an invariant value sum over its entire life, but a diminishing sum as the productive services inherent in it are gradually exhausted. If, for example, we assume that these services are used up in equal annual installments the net capital represented by the asset—i.e., the value of the productive services that remains stored up— declines from $10,000 at the moment the item is installed to $9,000 a year later, and so on.

Unfortunately, the calculation of the value of productive services used up each year—depreciation—further complicates our task. In the numerical example just employed, it was assumed that these services are used up in equal installments—in technical parlance, that depreciation follows the "straight line" pattern. Partly because of its simplicity, the straight line formula is widely used, but many believe that it is not appropriate.[3] They reason that, be-

cause of gradual physical deterioration, the services yielded annually by a given asset are larger in the initial period of its operation and decline over its service life; and that in the absence of other information technological obsolescence should be assumed to occur at an equal *percentage* rate. This view of the matter suggests an accelerated pattern of depreciation, according to which depreciation is highest in absolute amount when the equipment is new and declines as its age increases.

There is no general agreement among the advocates of accelerated depreciation as to what particular pattern is the most realistic; various formulas have been suggested and are in use. One of the most popular ones is the (double) declining balance method of depreciation. According to this method, twice the straight line rate of depreciation is charged in the first year, and the same rate is applied in succeeding years to the remaining value of the equipment. In our example, $2,000, or 20 percent, depreciation would be charged in the first year, and the same percentage rate would be applied to the $8,000 remaining value of the item, yielding depreciation of $1,600 during the second year, and so forth.

The following calculations of net capital stocks have been made on the alternative assumptions of straight line and double declining balance depreciation. This complicates the interpretation of the net stock figures as compared with that of gross stocks. In addition to considering two life assumptions (one

conforming most closely to existing practice and one based on Bulletin F) we must now take account of two further variants (straight line and declining balance) under each of these headings.

Rise in the postwar period

It will be best to summarize developments with respect to net stocks (see table 4 and the chart on p. 16) by reference to the generalizations already made about gross stocks: Over the postwar period, the increase in net capital stocks, i.e., in productive services stored up for future use, appears to have been somewhat larger than that in gross stocks, i.e., in capital stocks without allowance for the partial exhaustion of the services they embody. The several net stock variants examined all indicate approximate doubling as compared with the three-quarter increase for gross stocks.

The increase of net stocks, like that of gross stocks, has tapered sharply over the postwar years. For the 1945–49 period, in which the initial postwar rebuilding occurred, the annual rate of increase of the several variants averaged about 8 percent. For the subsequent 4-year periods, all net variants showed approximately identical annual rates of growth of about 5 percent, 4 percent, and 2 percent, respectively.

The net stock figures indicate a larger increase for structures than do the gross figures—from two-thirds to almost one

3. E.g., George Terborgh, *Realistic Depreciation Policy*, Machinery and Allied Products Institute, Washington, 1954

Table 4.—Net Stocks of Fixed Business Capital,* Selected Years, 1929–61

[Billions of constant (1954) dollars]

| | Based on Bulletin F lives | | | | | | | | | | | | | | | | | | | | | | | | Based on lives 20 percent shorter | | | | | | | | | | | | | | | | | | | | | | | |
| | Straight line depreciation | | | | | | Declining balance depreciation | | | | | | Straight line depreciation | | | | | | Declining balance depreciation | | | | | |
	1929	1945	1949	1953	1957	1961	1929	1945	1949	1953	1957	1961	1929	1945	1949	1953	1957	1961	1929	1945	1949	1953	1957	1961
Total	229	191	205	296	344	365	187	150	201	241	251	297	169	149	205	242	286	301	154	116	162	195	227	243
Structures	163	124	137	150	183	205	124	97	111	129	164	172	137	95	108	126	164	178	113	74	88	106	129	147
Equipment	66	67	109	140	161	160	62	53	90	112	127	125	52	53	91	116	128	133	41	42	73	90	90	96
Farm	28	27	34	40	42	41	23	31	28	33	33	33	23	21	27	33	33	31	19	16	22	25	25	25
Structures	20	17	18	19	20	21	10	13	14	18	17	17	17	13	14	15	16	17	13	10	11	13	14	14
Equipment	8	10	16	21	21	20	7	8	13	17	17	16	7	8	13	17	16	14	6	6	11	14	12	11
Manufacturing	47	44	58	71	82	89	38	35	49	58	58	72	39	36	49	53	58	72	31	28	49	47	55	57
Structures	27	22	26	28	32	35	22	17	21	24	28	29	23	17	21	28	28	30	19	13	17	19	22	25
Equipment	19	22	34	43	50	63	16	18	28	34	40	42	15	19	28	35	40	42	12	15	23	28	32	33
Other	154	126	153	185	219	236	129	94	124	150	179	193	128	92	124	161	174	197	104	73	100	125	146	159
Structures	115	85	94	133	130	150	96	68	76	90	100	126	97	66	74	87	109	131	60	51	60	73	93	108
Equipment	38	35	60	76	90	96	30	27	45	60	70	67	30	27	50	63	70	66	34	21	40	49	54	51

*At year end.

Source: U.S. Department of Commerce, Office of Business Economics.

hundred percent, depending on the variant selected, as compared with one-third for gross stocks. On the other hand, the postwar expansion of net equipment stocks is about 10 percent less than the increase indicated by the corresponding gross calculations.

As in the case of gross stocks, the tapering in the rate of growth is traceable mainly to equipment. In particular, it can be seen for table 3 that all variants of net equipment stocks are about stationary after 1957.

The larger expansion of total net stocks than of gross stocks, and the larger role of structures in the net stock expansion, is reflected industry-wise in the comparative records of manufacturing and the nonfarm nonmanufacturing industries. It will be recalled that structures constitute a relatively larger part of total stocks of the latter group as a whole. Fixed capital stocks in nonfarm industries outside manufacturing appear to have doubled approximately in terms of the net concepts, as compared with the two-thirds increase indicated for gross stocks. Within these broad groups, the contribution of equipment was larger than that of structures, as for gross stocks, but the differential was much smaller.

It can be seen from table 4 that the other points made in connection with the description of the broad industry pattern of the gross stock increase hold generally for the net variants also.

If the period under review is extended back to 1929, total net stocks—like gross stocks—appear to have declined through the 1930's and World War II, but the extent of the decline was somewhat more pronounced. The decline indicated for the total reflected the structure component; at the end of World War II net stocks of equipment—again like gross stocks—appear to have been about as large as in 1929. As in the case of gross stocks, the postwar investment boom has served to restore approximately the relation of equipment stocks to total output that obtained in the late 1920's. However, the ratio of structure stocks, and consequently of total fixed capital, has not been restored. (Table 3.)

As in the case of the similar conclusions regarding the gross capital-output ratio, the structure figures have been

derived from calculations that for deflation purposes utilized the construction cost indexes whose possible shortcomings have already been noted. But if overall GNP deflators are again substituted experimentally for the construction cost indexes, the broad conclusions regarding the relatively slow growth of structure stocks, and the consequent reduction of the capital-output ratio continue to hold, though in a somewhat attenuated form—just as in the case of the gross variants.

Substitution of overall GNP deflators for construction cost indexes substantially modifies also the picture of the postwar increase in net stocks. As in the case of the corresponding gross calculations, the dimensions of the postwar boom appear to be larger, and the share of structures in the total expansion is increased. But whereas for the gross variants, equipment stocks continued to show a larger percentage expansion than structures on the basis of the alternative deflation, in the case of net stocks no consistent differential between the indicated expansion of structure and equipment stock remains, the relative movement of the two components depending on the particular depreciation variant used.

Composition of stocks in 1961

Finally, we comment on the composition of net capital stocks in 1961, as contrasted with the composition of gross stocks shown in the second chart. On a net basis the share of equipment in the total is somewhat lower than on a gross basis—between about 40 and 45 percent of the total depending on the variant adopted. The broad industry composition of the total is very similar for all variants of net stocks, and similar in turn to that of gross stocks. As compared with similar breakdowns for 1929, the share of net equipment stocks has increased; and so has the share of manufacturing at the expense of nonfarm industries outside manufacturing. It will be recalled that similar changes were indicated by the percentage distribution of gross stocks.

It is interesting to note that the percentage distributions of net stocks for 1929 and 1961 are not changed by the substitution of overall GNP deflators

RATIOS OF NET TO GROSS CAPITAL STOCKS

Leveling Reflects Reversal of Postwar Rise for Equipment

Ratios for Structures Continue Up
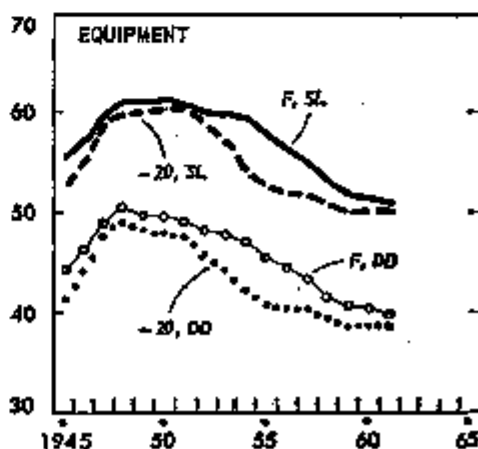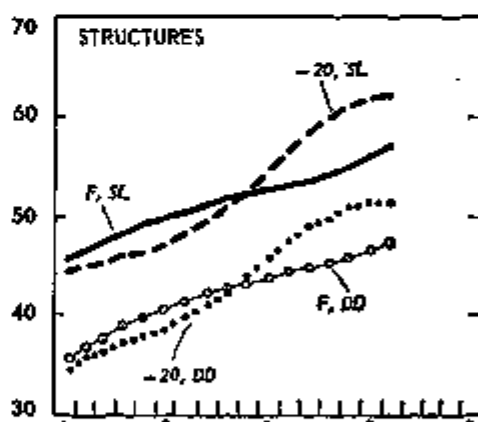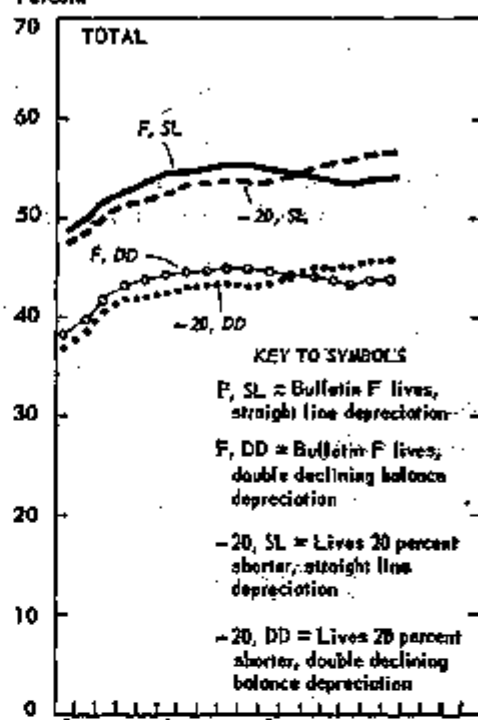
Table 5.—Ratios of Net to Gross Stocks of Fixed Business Capital, Selected Years, 1929–61

[Percentages based on constant (1954) dollars]

| | Based on Bulletin F lives | | | | | | | | | | | | Based on lives 20 percent shorter | | | | | | | | | | | |
| | Straight line depreciation | | | | | | Declining balance depreciation | | | | | | Straight line depreciation | | | | | | Declining balance depreciation | | | | | |
	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961
Total	56.1	48.6	54.3	55.2	54.1	54.0	45.7	38.2	44.2	44.9	44.2	43.8	54.4	47.0	52.3	53.5	55.7	54.5	44.1	35.7	42.4	43.2	44.6	45.5
Structures	57.1	65.6	49.7	51.7	52.6	56.5	47.0	85.5	48.5	42.8	44.9	47.4	54.8	44.3	46.8	60.8	46.2	57.1	45.0	34.4	28.4	42.3	65.7	51.4
Equipment	53.7	55.4	61.1	59.8	54.8	56.7	42.7	44.1	49.7	47.7	43.3	39.7	53.2	52.5	60.3	56.7	51.6	50.0	41.7	41.4	45.0	44.2	40.2	38.0
Farm	56.3	51.6	54.7	55.5	52.9	48.9	46.0	48.3	44.9	45.2	42.4	39.3	53.4	46.2	54.1	54.7	49.6	55.1	42.8	36.2	44.0	46.1	39.3	35.7
Structures	58.0	48.5	49.6	30.5	30.4	39.3	47.1	38.0	40.1	41.4	41.7	41.7	53.3	42.9	48.1	50.0	50.3	50.3	42.9	33.3	39.1	41.4	41.9	42.0
Equipment	54.3	56.0	61.2	51.2	55.4	47.6	43.6	44.7	50.8	49.4	43.1	36.9	53.6	53.9	61.6	56.9	48.0	45.8	43.5	41.5	50.2	47.0	37.2	35.2
Manufacturing	56.2	51.5	56.1	56.8	56.1	54.2	41.8	41.3	45.8	46.2	45.0	43.8	54.9	51.5	54.9	55.4	54.7	55.5	44.4	41.0	44.4	44.6	44.3	44.6
Structures	68.3	46.5	49.7	52.6	57.0	57.0	48.2	36.6	40.7	43.6	45.1	47.2	57.6	46.9	49.1	58.5	57.3	51.6	47.3	35.3	40.6	44.3	47.6	50.6
Equipment	53.3	57.7	61.9	60.1	57.2	52.6	42.6	47.2	50.6	46.5	45.9	41.8	51.2	59.3	59.8	57.1	53.0	52.3	40.6	45.8	47.7	45.2	42.0	41.0
Other	55.9	47.1	53.5	54.5	53.6	54.5	45.7	36.7	44.5	44.4	43.9	44.7	54.4	45.7	51.0	53.4	56.3	55.4	44.2	35.3	41.2	42.4	46.9	47.1
Structures	56.6	44.5	49.7	51.6	53.7	57.6	46.8	34.8	40.5	42.6	45.1	48.4	54.4	44.4	40.0	50.3	50.9	64.2	44.9	34.4	37.8	42.0	50.2	53.1
Equipment	53.7	53.5	60.6	59.2	55.4	56.1	42.5	42.1	49.1	46.9	42.1	39.2	54.2	49.1	60.3	55.6	51.6	48.6	42.1	37.8	47.6	43.0	40.0	37.9

Age of Capital Stocks

Obvious interest attaches to the age structure of our capital stock and it components. Information of this type is essential for gaging the extent to which the stock is up-to-date both in terms of physical condition and technological characteristics.

No analysis will be made in this report of the detailed age distribution data that are part of the complete study underlying this summary report. Instead two sets of measures which summarize the central tendencies in these age-distributions will be presented. The first of these, shown in table 5, gives the ratios of the net stocks of capital to the gross stocks, for the several variant definitions distinguished so far. An alternative set of measures, presented in table 6 for the same variants, is the mean age of the capital stock and its components.

These two sets of measures can be used interchangeably for many purposes, but each of them also provides specific information. Thus, the ratios show the relative extent to which the services initially embodied in capital goods remain intact—on the assumption that the purchase price is a measure of the value of the services bought initially and that depreciation reflects the value of the services that have been used up. This type of information is not provided by the average-age meas-

for construction cost indexes in the computation of structure stocks.

Table 6.—Mean Age of Stocks of Fixed Business Capital, Selected Years, 1929–61

[Based on Constant (1954) dollars]

| | GROSS STOCKS | | | | | | | | | | | |
| | Based on Bulletin F lives | | | | | | Based on lives 20 percent shorter | | | | | |
	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961
Total	14.7	15.5	13.6	14.4	14.8	13.6	11.1	15.3	12.6	11.6	10.6	10.9
Structures	18.5	28.6	22.1	21.4	20.4	19.0	15.7	19.9	18.3	17.0	15.0	13.8
Equipment	6.7	6.0	5.7	5.9	6.6	7.2	5.2	5.3	4.4	4.8	5.4	5.6
Farm	28.4	33.1	35.2	36.4	28.4	29.2	25.7	39.3	23.3	20.9	20.7	21.5
Structures	37.7	46.5	40.4	44.6	44.7	44.7	33.5	41.2	37.5	30.0	35.5	35.7
Equipment	7.3	7.1	6.2	6.3	7.1	8.4	6.6	5.7	4.6	4.8	6.1	6.5
Manufacturing	12.5	15.0	12.5	12.6	11.8	11.5	10.5	12.8	10.3	9.4	9.0	8.5
Structures	16.7	21.4	20.1	19.0	17.9	17.2	13.6	17.6	16.3	14.9	13.6	12.3
Equipment	7.9	7.2	6.6	6.3	7.6	8.1	6.8	5.3	5.2	5.6	6.1	6.2
Other	13.2	16.4	13.6	13.6	13.4	11.7	11.1	13.1	11.6	10.5	8.7	8.2
Structures	14.6	19.6	18.1	17.4	16.7	16.2	13.2	16.1	15.6	14.4	11.6	10.4
Equipment	6.0	6.0	5.1	5.3	6.1	6.4	4.6	5.1	4.0	4.4	4.8	5.0

	NET STOCKS											
	Based on Bulletin F lives											
	Straight line depreciation						Declining balance depreciation					
	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961
Total	10.0	12.4	9.6	9.0	9.3	8.1	9.2	11.7	8.6	8.3	7.6	7.4
Structures	12.9	17.0	14.7	13.1	11.3	11.1	11.4	14.2	13.3	11.8	10.4	10.3
Equipment	4.5	4.4	3.8	4.3	4.6	4.9	4.1	4.0	3.5	3.6	4.2	4.5
Farm	20.9	23.7	18.2	15.8	16.7	16.1	19.9	22.5	16.6	15.3	15.5	16.0
Structures	27.0	35.0	31.6	29.9	28.6	27.5	25.1	33.9	29.3	27.8	25.9	25.5
Equipment	4.8	4.8	3.9	4.3	5.4	4.9	4.4	4.4	3.6	4.0	5.0	5.4
Manufacturing	8.7	9.8	7.9	7.5	7.3	7.6	8.6	9.1	7.3	7.0	6.7	7.0
Structures	11.1	15.8	12.9	11.8	10.6	10.7	10.2	14.4	11.8	10.7	9.6	9.9
Equipment	5.3	4.5	4.5	4.7	5.1	5.4	4.9	4.1	4.1	4.4	4.7	5.0
Other	8.8	11.4	8.6	7.8	7.3	7.3	8.0	10.7	7.8	7.2	6.8	6.7
Structures	10.3	14.3	12.0	10.8	9.2	8.8	9.4	13.5	10.9	9.7	8.6	8.2
Equipment	4.0	4.3	3.4	3.8	4.1	4.4	3.8	3.9	3.1	3.6	3.8	4.1

| | Based on lives 20 percent shorter | | | | | | | | | | | |
| | Straight line depreciation | | | | | | Declining balance depreciation | | | | | |
	1929	1945	1950	1953	1957	1961	1929	1945	1950	1953	1957	1961
Total	8.7	10.2	7.6	6.8	6.3	6.5	7.7	9.5	6.9	6.3	5.7	6.1
Structures	10.9	14.2	11.3	9.9	8.7	8.9	9.6	13.5	10.1	8.9	8.0	8.2
Equipment	3.5	3.5	3.1	3.6	3.9	3.9	3.2	3.2	3.2	3.3	3.3	3.5
Farm	18.2	21.6	13.9	12.9	13.1	13.1	17.3	18.6	13.7	11.9	12.3	12.3
Structures	24.0	29.3	25.2	23.2	22.0	21.2	22.7	27.9	22.2	20.9	20.0	19.4
Equipment	3.6	3.8	3.0	3.5	4.4	4.3	3.3	3.6	2.7	3.3	4.1	4.0
Manufacturing	7.1	7.8	6.3	6.9	5.6	6.0	6.5	7.2	5.7	5.4	5.3	5.6
Structures	9.1	12.4	9.8	8.9	8.1	8.6	8.3	11.6	9.0	8.1	7.4	8.0
Equipment	4.1	3.5	3.7	3.9	4.0	4.2	3.7	3.3	3.4	3.6	3.7	3.9
Other	7.1	9.5	6.5	5.9	5.3	6.0	6.5	8.9	6.0	5.4	5.1	5.6
Structures	8.8	12.0	9.2	7.9	6.9	7.3	7.6	11.3	6.2	7.1	6.4	6.6
Equipment	3.1	3.4	2.7	3.2	3.2	3.4	2.8	3.1	3.5	2.8	2.9	3.1

ures. In contrast, the latter provides information on absolute age not provided by the net-gross ratios.

Two other examples of the partial independence of the two measures may be given. Consider, for instance, a shift in the capital stock towards items having a longer service life, but assume also that the proportion of services stored up in the gross stocks are and remain the same for all types of capital equipment. In these circumstances, the average age of the capital stock will increase, but the net-gross ratios will show no change. While this example is artificial, in the sense that the assumptions underlying it are not likely to hold in any real situation, it does bring out an important difference between the two measures, and indicates that a choice may have to be made between them depending on the nature of the proposed analysis.

Another instance in which the two measures may point in different directions should be noted: Even for items of uniform service life, it is entirely possible for the net-gross ratios to increase (decrease) and for the average age of the capital stock to increase (decrease) at the same time, and although the first impression is that this cannot occur.

If the straight line method of charging depreciation is employed, a movement in the same direction of net-gross ratios and of the average age of net capital stocks is possible essentially because we are dealing with two averages that are weighted differently. The net-gross ratios can be seen to involve the assignment of gross value weights to the ages of the various items; in the average-age calculations for net stocks the corresponding weights are net (depreciated) values.

II, in addition, we depart from straight line depreciation, further opportunities arise for seemingly inconsistent movements of the net-gross ratios, on the one hand, and of the average-age figures, on the other. These stem from the fact that with alternative methods of depreciation, the net-gross ratios for individual items are no longer inversely proportional to the ratios of their age to their total service life.

Changes in the age structure of capital

In summarizing the information relating to net-gross ratios in table 5 and the fourth chart, we shall concentrate on changes in these ratios rather than on their levels. With respect to the latter, it will be sufficient to note that in the case of straight line depreciation significance attaches to the 50 percent figure. This is the figure that would be reached in stationary conditions in which new investment just equaled the capital goods used up. For the double declining method of depreciation the corresponding ratio is significantly lower and depends on the length of the service life. For a service life of 10 years the ratio is approximately 38 percent, for service lives of 20 and 40 years it is about a percentage point higher.[9]

Common to all the variants shown in table 5 is a rapid improvement in the net-gross ratios for equipment in the early part of the postwar period and a subsequent decline of substantial proportions. This pattern of the equipment calculations for the business system as a whole is repeated also in the equipment series for the major industry groups. With near unanimity the alternative variants indicate that the most recent net-gross ratios are below those that obtained at the end of World War II. As can be seen from table 5, current equipment stock ratios appear to be a little below those obtaining in 1929.

Net-gross ratios for structures follow a pattern that is quite different. According to all variants shown here, the improvement from the low ratios at the end of World War II has continued throughout the postwar period, and these ratios are now higher than those of 1929 for the shorter life variant. As in the case of equipment, the overall pattern is reflected in that of the several groups.

The net-gross ratios for equipment and stocks combined represent an average of the separate ratios, the postwar upsurge being followed by a period of relative stability. There seems to be little change from 1929 in the overall ratios.

Table 6 presents calculations of the average age of structures and equipment for the variant concepts shown in table 5. Perspective is gained if these figures are compared with the total service lives of structures and equipment as given in table 7 (technical appendix).

The story told by these average-age series is of course very similar to that conveyed by the net-gross ratios: A marked reduction in the average ages of both structures and equipment in the early postwar years was followed for structures by somewhat more moderate improvement during the remainder of the period. Equipment stocks, on the other hand, have aged in recent years. Combined ages have continued to fall, reflecting the larger weight of structures. The separate patterns of the three broad industry groups appear to have been quite similar.

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9. It should be noted that the exact numbers depend on the method that is adopted to ensure that the entire value of the capital asset is depreciated over its assumed service life.

Table 7.—Service Lives in Years, Corresponding to Seven Alternative Assumptions, by Industry Group, and Type of Asset

Alternative assumptions	Nonfarm residential structures	Manufacturing		Nonfarm, excluding manufacturing		Farm		
		Equipment	Nonresidential structures	Equipment	Nonresidential structures	Equipment	Nonresidential structures	Residential structures
40 percent longer	70	24	56	16	50	23	126	140
30 percent longer	60	21	48	16	43	19	108	120
10 percent longer	55	19	44	15	40	18	99	110
Bulletin F	50	17	40	13	36	16	90	100
10 percent shorter	45	15	36	11	32	14	81	90
20 percent shorter	40	13	32	10	29	12	72	80
40 percent shorter	30	10	24	8	22	9	54	60

Source: U.S. Department of Commerce, Office of Business Economics.

(Continued from p. 5)

employees costing about $¼ billion[1] for the three quarters of the current fiscal year it is in effect.

Federal expenditures other than for goods and services are slated to rise by almost $3 billion, with transfer payments to individuals up $1¼ billion, largely unchanged from the January estimate. Higher unemployment compensation payments, in line with the lower than earlier estimated rise in economic activity, were offset by the reductions from estimated budget expenditures made by the non-passage of proposed legislation, such as the youth employment opportunities program. Federal aid to State and local governments would rise because of higher highway construction and public assistance outlays. The effects of the accelerated public works program will probably be only small in this category of Federal spending.

Interest charges are projected about $½ billion higher than in the past fiscal year, partly because of the increase in the national debt and partly because of a higher average rate of interest to be paid. Finally, the "subsidies less current surplus of government enterprises" category will remain at about the current level of $4¼ billion, annual rate, rather than decline by $¾ billion as estimated in January. The postal rate increases are to become effective in January 1963 rather than in July 1962 as anticipated in the January budget and the postal pay raise was larger than proposed so that the postal deficit is larger than first estimated. In addition, the non-passage of certain parts of the President's farm program proposals is expected to increase the deficit of the Commodity Credit Corporation.

(Continued from p. 7)

the first year of the current expansion, continued the rise begun in the second quarter. By virtue of the gains of the last two quarters, business fixed investment, after allowance for price increases is currently well above 1960's peak quarter and about back to the postwar peak reached early in 1957. As a percentage of GNP, however, outlays for plant and equipment are still somewhat lower than in 1956–57.

Residential construction

There was a further sharp rise in residential construction activity for

[1] This excludes the cost of the pay raise for Post Office employees, which is included in the "subsidies less current surplus of government enterprises" category discussed below.

the quarter, bringing the cumulative rise since the 1961 first quarter low to over 25 percent. After allowance for price changes, the third quarter rate about matched that of the second quarter of 1959, the previous high in residential construction activity. Housing starts during the quarter were off somewhat from the spring peak, but the behavior of this series has been highly erratic in recent quarters.

Lower inventory accumulation

Businessmen sharply reduced their rate of inventory accumulation for the second successive quarter, following three quarters of cyclical recovery in 1961, and a moderate degree of hedging against a steel strike in the first quarter of this year. Additions to stocks during the quarter in terms of annual rates amounted to only $1 billion as against $4 billion in the second and nearly $7 billion in the opening quarter of the year.

In contrast to the second quarter decline, which reflected principally a reaction from the first quarter buildup in the durable goods lines, third quarter additions to stocks were lower in most areas of production and distribution, and there was some liquidation of stocks among distributors of nondurable goods. Automobile dealers were a notable exception, accounting for most of the third quarter gain, as stocks were built up to meet the requirement for 1963 model cars.

Appendix

This appendix describes the procedures used in deriving the full set of calculations of capital stocks and related items upon which this summary report is based. This project has been planned in the Office of Business Economics as part of an inter-departmental study of economic growth in which OBE cooperates with the Bureau of Labor Statistics, the Council of Economic Advisers, and other Federal agencies. The programing and machine work were done on contract by CEIR, Incorporated, formerly the Corporation for Economic and Industrial Research.

The calculations are based on a summary, short-cut methodology; they will be followed by a second version based on more elaborate techniques. In particular, separate distributions of lives will be used for a list of more than 40 items of equipment and structure types; in the present study only eight average service lives are used. (See below.) No allowance is made for dispersion of retirements around the average service lives.

In view of the nature of this pilot project, some of its results will probably have to be modified when the results of the more detailed study become available.

The series cover fixed capital assets—structures and equipment—located in the Continental United States and owned by U.S. private business (including private ownership of residences), nonprofit institutions, and foreigners.

Series have been prepared for residential structures, nonresidential structures, and for equipment; the first of these items is carried separately and not included in any of the type

of asset or industry summaries. (The residential estimates have not been used in the preceding article.)

Breakdowns are provided for farm, manufacturing, and all nonfarm nonmanufacturing industries combined, in addition to subtotals and totals for these industrial groups.

Calculations have been made for gross capital stocks, discards, depreciation, net capital formation, net stocks, ratios of net to gross stocks, and the age composition of gross and net stocks. All these are continuous time series for the period 1925 or 1930 to 1961, except for the age composition data which are given only for selected years.

The figures were prepared by the perpetual inventory method—involving the application of expiration dates to time series on gross investment—and accordingly necessitated assumptions as to economic lifetime and proper depreciation formula.

There is no consensus as to what are the economic lifetimes of capital assets. One set of estimates was prepared largely on the basis of lifetimes published in Bulletin F (1942 edition) of the Internal Revenue Service, and, in the case of the farm components on Department of Agriculture data. In addition, estimates based on lifetimes 10 percent, 20 percent, and 45 percent longer and shorter were calculated. These seven lifetimes were used in all the calculations except in the age distribution tabulations in which the 10 percent variants were omitted.

A similar approach was taken in the depreciation calculations. Since we do not know what is the economically correct formula for spreading depreciation over the lifetime of a capital asset, five different formulas were used: Straight-line; 1½, double, and triple declining balance method; and the sum of the years-digits method. All series affected by the variant calculations of depreciation were computed for each of the depreciation formulas.

Finally, there is no single economically correct method for valuing capital stocks and related magnitudes. Different valuations are relevant for different purposes. In the light of this, the estimates have been presented on alternative bases of valuation. The first set is in terms of historical costs.

The second set is in terms of constant (1954) dollars. In view of the well-known uncertainties attaching to price index numbers, two versions of the constant-dollar figures are calculated in addition to the basic version (1) which uses the implicit price deflators for producers' durable equipment and construction prepared for the national income and product accounts. In view of their possible deficiency—they measure, in general, prices of inputs rather than of outputs—the construction deflators were replaced by (2) the implicit deflator for nonfarm business GNP as a measure of the price of structures. In view of the known inability of price indexes to reflect quality improvement comprehensively, a further adjustment was applied to variant (2) for structures, and to variant (1) for equipment. This variant (3) assumes a one percent per year allowance for unmeasured quality improvement. Needless to say, this latter adjustment is speculative; it has little conceptual or statistical foundation, and is introduced only because it has been suggested by responsible students in the field.

The third set of valuations is in terms of current dollars. This set expresses the physical volumes of a particular time in terms of the prices that actually prevailed at that time. Inasmuch as this involves multiplication of series expressed in 1954 prices by the ratio of given period prices to 1954 prices, it can be seen that a separate current-dollar version corresponds to each of the three constant-dollar calculations.

Current-dollar calculations for net-gross ratios and age composition calculations have been omitted. It is believed that they are of lesser interest than the historical and constant-dollar calculations, and that they would not differ materially from the latter.

The machine calculations were based on the following separate time series of gross capital formation:

Residences, farm
Residences, nonfarm
Nonresidential structures, farm
Nonresidential structures, manufacturing
Nonresidential structures, all other private industries
Equipment, farm
Equipment, manufacturing
Equipment, all other private industries

Each of these series was provided in historical dollars as well as in constant-dollars—including all applicable variants of the latter valuation, as discussed above. Table 7 presents the average lifetimes based mainly on Bulletin F (1942 edition) information and the six additional lifetimes that were assumed.